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This paper seeks to establish the mistakes in the development of American armored forces during the interwar period. It then analyzes the aspects of the U.S. Armored Force that made it unique and effective during combat in Western Europe. The Armored Force that landed in Normandy was different from any other force in the world. Its strengths were its tactical mobility, high quality equipment, flexible command and control, and unmatched lethality from combined arms coordination. When properly led, this force proved to be a decisive factor on the battlefield.

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ARMORED FORCE: THE RAPID DEVELOPMENT OF A UNIQUELY AMERICAN FORCE

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

Major J. B. Conway

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Executive Summary

Title: Armored Force: The Rapid Development of a Uniquely American Force

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Thesis: Although initially delayed by neglect of the tank forces during the interwar period, the United States successfully developed a uniquely American armored force to lead the Allied advance across Western Europe.

Discussion: In the years following World War I, the United States' effort to develop an armored force was hampered by budgetary constraints and a lack of unified doctrine for tank employment. As armored forces assumed a dominant role in several European armies, the tank was alternately viewed in the United States as a supporting arm to the infantry and the horse cavalry. At the outbreak of World War II, the U.S. Army was stunned to see how armored forces had led the German blitzkrieg over the Allied forces. The War Department responded quickly and established the U.S. Armored Force in June 1940.

The rapid development of the Armored Force was a remarkable achievement. Although initially there were many misunderstandings and mistakes in the organization, equipment, and tactical employment of the armored divisions, the U.S. applied the lessons learned from the Allies and its own experience in North Africa in preparation for combat in Western Europe. The Armored Force that landed in Normandy was unique from any other force in the world. Its strengths were its tactical mobility, high quality equipment, flexible command and control, and unmatched lethality from combined arms coordination. When properly led, this force proved to be a decisive factor on the battlefield.

This paper seeks to establish the mistakes in the development of American armored forces during the interwar period. It then analyzes the aspects of the U.S. Armored Force that made it unique and effective during combat in Western Europe.

Conclusion: Despite the numerous mistakes made during the interwar period, the United States was able to field a unique and effective armored force to lead the Allied advance across Western Europe.

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J. B. Conway

By the conclusion of the First World War, the tank had established itself as a powerful new weapon with untapped potential. Tank theorists foresaw the advantages of large armored forces dashing across future battlefields and hitting the enemy deep in his weakly protected flanks and rear areas. The armored forces had the potential to become a much faster and more lethal variant of the heavy horse cavalry of old and the decisive new arm on the battlefield. In several of the European armies, much of the interwar period was spent developing new tank technologies and experimenting with armored formations. Through years of trial and error, the Germans were able to develop the modern armored force envisioned by the tank theorists. At the beginning of World War II, they employed the new force with great effect and shocked their enemies with its success.

Across the Atlantic, the United States lagged far behind in exploring the potential of the tank. Stuck in the tank doctrine of the First World War, the United States Army continued to use the tank as a moving pillbox, travelling at the speed of the infantry in the assault. Inter-army squabbling, limited financial resources for tank development, and lack of foresight severely hampered the progress of the United States armored forces. It wasn't until 1940 when the German panzer units spearheaded the blitzkrieg attack through France that the United States finally realized its mistake and began developing a modern armored force of its own. In a relatively short period of time, the United States developed a fleet of modern tanks, established an effective doctrine, and created armored formations that fought as balanced combined arms teams. Although initially delayed by neglect of the tank forces during the interwar period, the United States successfully developed a uniquely American armored force to lead the Allied advance across Western Europe.

Stagnation during the Interwar Years

The United States Tank Corps was established by General John Pershing in December 1917. Its purpose was to break the stalemate of trench warfare. Founded as an independent arm that answered directly to the American Expeditionary Force Commander, the Tank Corps responsibilities included development of tank doctrine, training, and employment of tactical forces. As the United States had yet to begin manufacturing tanks, the Tank Corps was completely reliant upon existing French and British models. Fighting in French light tanks and British heavy tanks, the U.S. tank doctrine was also a combination of the Allied methods for tank employment. Similar to British Doctrine, heavy tanks were used prior to the infantry assault to penetrate the enemy's trench system and destroy strong points. In compliance with French Doctrine, light tanks were used to accompany the infantry during the assault to provide direct fire support.[1]

At the conclusion of the First World War, tank enthusiasts began speculating on the possibilities of the tank in future warfare. In England, experimental "all tank" formations were created that were designed to replace the infantry, cavalry, and artillery.[2] In the U.S., tank doctrine continued along a conservative approach that favored tank employment in direct support of the infantry. A Fort Leavenworth instructional pamphlet from 1920 entitled *Tactics and Technique of Tanks* stated:

> The tank should be recognized as an infantry supporting and accompanying weapon, incapable of independent, decisive, strategic, and generally, tactical action. The infantry, or other formed troops, must accompany or immediately follow tanks. Otherwise no ground will be held, as tanks can neither consolidate nor hold ground for any length of time any position taken. The tanks must operate as a result of certain decisions and plans of maneuver made by infantry or other formed troops. There is no such thing as an independent tank attack.[3]

As U.S. tank employment was closely aligned with the infantry assault, army leadership began to wonder if the overhead of maintaining an independent Tank Corps was worth the expense. During congressional hearings in 1920, the leadership of the Tank Corps was unable to provide a strong argument for their continued existence as an independent arm. Additionally, key figures such as General Pershing argued against an independent Tank Corps and testified that tanks should only be employed directly in support of the infantry. As a result, the National Security Act of 1920 declared the formal abolishment of the U.S. Tank Corps and subordinated the remaining tank units to the Chief of Infantry.[4]

During the 1930's, the infantry arm made only minor modifications to tank employment from World War I doctrine. Coordination was improved between the rifleman and the tank, but tanks were still used in direct support of the foot soldier and were discouraged from independent action. A memo from the War Department dated 6 April 1938 and titled "Policies Governing Mechanization, and the Tactical Employment of Mechanized Units" summed up the infantry's viewpoint of tank employment:

> In the attack, the leading echelon [of tanks] advances closely behind the supporting fire of the artillery and heavy infantry weapons. These tanks, with the support of other weapons, have the mission of dominating the antitank guns. The second echelon, closely followed by the foot troops, advances with the mission of dominating the enemy's machine guns. These are the accompanying tanks that break into the hostile position with the infantry. [5]

Deep, sweeping flank marches were thought to be cavalry operations. Although the senior leadership of the army talked about future battles as fast-moving wars of maneuver, infantry tank doctrine remained better suited to the World War I battlefields.

Contrary to the prevailing attitudes towards armor in the United States, British tank advocates such as J. F. C. Fuller and B. H. Liddell Hart argued mechanized columns would become the critical element on future battlefield achieving decisive effect through speed and

firepower. Although well received in many European armies, these arguments did not gain much traction in the United States. Major George S. Patton Jr., the cavalry officer responsible for articulating the viewpoints of the Chief of Cavalry in articles and memorandums, completely rejected the visionary ideas as unrealistic. Patton was unique in that he had served with the Tank Corps during the war and had a detailed knowledge of the capabilities and limitations of the U.S. fleet of tanks. In Patton's viewpoint, tank employment was restricted by the technical limitations of tanks themselves. Development of new tanks was a costly, time-consuming process, and not a priority for the army in the 1930's.[6] Without the development of more capable tanks, the US Army was handicapped in evaluating the potential of new tank doctrine.

In the late 1920's, the U.S. cavalry arm begrudgingly began using tanks and mechanized vehicles. The catalyst for change was the questionable value of horse cavalry as armies around the world began to mechanize their forces. The cavalry, concerned with becoming an obsolete force, responded to the calls for modernization by creating a new regiment made up of mechanized and motorized vehicles. Light tanks were included in the new regiment, but they were called "combat cars" as the assignment of tanks to the cavalry would have required an act of congress.[7] Originally assigned reconnaissance and scouting missions, the new mechanized regiment performed admirably when adequate roads and bridges were available, however, terrain was still a limiting factor and the horse cavalry maintained an overall advantage in tactical mobility.[8]

In the mid-1930's, the cavalry's mechanized regiment made progress was made towards becoming a self-sufficient mechanized combined arms team with the addition of infantry, artillery, engineers, and aviation assets. Close support from these elements greatly enhanced the mission set and tactical mobility of the mechanized regiment. Still, horse cavalry advocates

refused to acknowledge the passing of the torch. In 1937, there were only two mechanized cavalry regiments compared to 13 horse cavalry regiments.[9] Colonel Adna Chaffee Jr., the commander of the mechanized regiment, and future "Father of the American Armored Forces," was bewildered by his colleagues' unwillingness to accept change:

> They seem blind to the possibilities of a mechanized cavalry. I believe that mechanization and horses will not greatly mix within the cavalry division. Those fellows at Riley ought to understand that the definition of cavalry includes troops of any kind equipped for highly mobile combat and not just mounted on horses. The motto of the School says, "Through Mobility We Conquer." It does not say, "Through Mobility on Horses Alone We Conquer." [10]

Even having demonstrated expanded capabilities, the mechanized regiment was limited to a supporting role and the horse regiments remained the featured cavalry force.

As mechanized forces demonstrated increased potential on the battlefield, advocates of mechanized and armored forces faced the additional challenge of overcoming traditionalist views within the various branches of the army. Instead of encouraging the growth of a new capability within the army, the Chiefs of the Infantry and Cavalry viewed the creation of an independent armored force as a threat to the resources and funding of their own branches. As a result, there were two separate tank doctrines developed by the two branches, neither of which maximized the potential of an armored force. As late as 1940, the Chiefs of the Infantry and Cavalry recommended against the formation of the armored force as a "separate combat arm."[11] Unfortunately, this mindset put the United States Army at a significant disadvantage to other armies in the creation of an armored force and tank doctrine.

The lack of foresight and branch loyalty were not the only reasons tank development suffered through the interwar period; there were other points used in the argument against an independent armored force. Throughout the 1930's, a lack of development of new tanks continued to limit the development of tank doctrine. As a result of the Great Depression, the

early 1930's were tough times for the Army and it reached a low of 134,000 troops in 1931. Faced with the dilemma of using the meager resources to fund troop strength or purchasing new equipment, the Army leadership chose the former.[12] The result was the continued use of slow-moving, mechanically unreliable, and outdated vehicles that further served to minimize the tanks potential in the minds of many officers.

The value tanks as an independent force was further called into question by combat reporting from Europe. During the Spanish Civil War of the late 1930's, German-made 37mm anti-tank guns proved highly effective in stopping the unsupported assaults of light tanks.[13] There were several lessons that should have been learned from this situation, but at the time were incorrectly interpreted. The first lesson was tanks should not assault defensive positions without the close support of a combined arms team. The second lesson was the need for heavier armor protection on tanks. Instead, proponents of horse cavalry and infantry cited the success of anti-armor weapons as an argument against the value of tanks as a decisive factor on the battlefield.

Birth of the U.S. Armored Force

The stunning success of the German blitzkrieg attack against the Allied armies in June 1940 sent shockwaves through the U.S. Army. Of particular concern was that the similarity in U.S. and French tank doctrine as the French method of battle had proven completely inadequate against the fast moving German attack.[14] Coincidentally, the U.S. Third Army was wrapping up a large scale maneuver at the same time the British Forces were being evacuated from Dunkirk. The Third Army horse cavalry units' poor performance against mechanized forces reinforced the urgent requirement for modernization.[15] Based on the convergence of these two events, on 10 June 1940, the U.S. Army Adjutant General authorized the creation of the Armored Force with Major General Chafee as the commander.

The Armored Force was based out of Fort Knox, Kentucky and its responsibilities included development of doctrine, training, and equipment as well as the establishment of several mechanized divisions.[16] Originally, it included the I Armored Corps, consisting of the 1st and 2nd Armored Divisions, and the 70th Medium Tank Battalion. Early estimates called for the development of 61 armored divisions; this number was continuously revised downward and ultimately, only 16 armored divisions were raised.[17]

Following the collapse of the Allied units in Europe, the natural tendency of the U.S. Armored Force was to try and analyze the success of the Germans. Hasty analysis caused several key features of the German armored forces to be misinterpreted; however, some of the misinformation was actually beneficial to the U.S. war effort. First, the speed of the blitzkrieg attack led many to believe the entire German Army was mechanized. This fallacy reinforced the obsolescence of the horse in modern warfare while simultaneously boosting U.S. industry efforts to produce an entirely mechanized force. Second, it was believed that all German tanks carried 75mm main guns or better. As a result, all U. S. medium tanks were required to carry similar armament which ensured the lethality of the U.S. tank fleet through the early part of 1944. Finally, the size of the German tank fleet was vastly overestimated. This falsehood was an important factor in the rapid expansion of the development of the U.S. Armored Force and initiated the process that resulted in the Tank Destroyer Force.[18]

Other misinterpretations were harmful to the development of the U.S. Armored Force. The importance of close support between the infantry and armor in German operations was overlooked. The U.S. did not realize that all successful German armored breakthroughs were initiated by infantry action.[19] The failure to grasp the relationship between infantry and armor led to the early development of U.S. armored units that were disproportionately tank heavy.

This misunderstanding was further propagated through the study of British tables of organization and methods of employment for armored units. The 1940 British armored divisions had only one or two infantry battalions and six to nine battalions of fighting vehicles. Even worse, the British divisions organized their fighting vehicles into two brigades while grouping all other combat units, including the infantry and artillery, into a support group. The support group and the fighting vehicle brigades had different missions and were employed as separate fighting echelons.[20]

In creating the force structure of the Armored Force, U.S. planners initially focused on the division. The 1940 table of organization for an armored division was understrength in infantry; there were three tank regiments (eight tank battalions) to only one infantry regiment (two infantry battalions). Two of the tank regiments were made up of light tanks. The tank battalions combined to form one massive brigade while the infantry and other combat units formed a support regiment. Similar to the British method of employment, the two elements were designed to operate independent of the other. These division structures remain until 1942, when the lessons learned in North Africa necessitated a change.[21]

One of the most positive outcomes in the creation of the Armored Force was the development of a unified doctrine for tank employment. The War Department issued Training Circular Number 4 in September 1940. The purpose of the circular was to guide the development of Armored Force doctrine. Coinciding with the development of force structure for the armored division, the circular provided a definition of the division as "a self-sustaining unit of specially equipped elements of the combined arms and services. It has great offensive power and mobility but only a limited and temporary capacity for the defense."[22] The circular went on to describe the armored division's main function as the attack of enemy flanks or rear areas. The

tank was identified as the primary offensive weapon; however, close support was required from all combat units.[23]

In January 1941, a tentative field manual for the armored division was published. It was largely based on continued analysis of German armored operations. The manual again stressed the offensive nature of armor and specified missions including critical objective seizure, envelopment, exploitation, and pursuit. Operating deep in the enemy's rear areas against soft targets, the armored division was capable of achieving decisive results through the spread of destruction, confusion, and demoralization of enemy units. As per the German example, subordinate unit commanders were encouraged to exercise initiative and take bold action so that the division would not loose momentum.[24] The United States had finally written doctrine that maximized the potential of the tank. Only minor modifications were made to the armored division field manual throughout the rest of the war.

In the early days of the Armored Force, limited tank production caused significant equipment shortfalls. Each armored division required a total of 3,243 vehicles including 1,140 fighting vehicles. The effect of the rapid expansion of new armored units combined with the Lend-Lease program to support the allies caused U.S. industry to fall behind the required production rates until late 1941, specifically that of medium tanks.[25] The equipment shortfalls caused trouble in training the large influx of personnel to the Armored Force.

Variants of the M2 light tank dominated the Armored Force in 1940. The latest model, the M2A4, weighed 12 tons and carried a 37mm main gun mounted in a single turret. It also had four coaxial mounted machine guns, two hull sponson machine guns, and armor up to one inch thick. Capable of speeds in excess of 30 MPH, it was considered highly reliable.[26]

The M2 medium tank series, although six and a half tons heavier, did not offer a significant increase in capability over the light tanks. The M2A1 medium tank carried the same 37mm main gun and one inch of armor as the light tanks. It carried six .50 caliber machine guns and a crew of five. Amid reports of more heavily armored and armed tanks fighting in Europe, production for the M2A1 was cancelled in 1940 and development of the M3 medium tank was started.[27]

One significant advantage of American industrial power was the ability to provide mechanized vehicles to all the supporting arms of the armored division. The M3 halftracks used by the infantry, artillery, and engineer units provided speed and tactical mobility to the armored division unmatched by any other army.[28] Use of the halftracks ensured the armored division's supporting arms were able to move at the speed of the tank thus facilitating close cooperation among the combined arms team.

In order to evaluate the progress of the U.S. Army's modernization, including that of the Armored Force, a series of major maneuvers were held in late 1941. The maneuvers, which included almost a quarter of a million men, where the largest training exercises ever conducted by the U.S. Army. Although the maneuvers provided the Armored Force valuable lessons regarding doctrine, command and control, and logistics support, they were also cited as evidence against the growth of the Armored Force.[29] The maneuvers were controlled by one of the detractors of the Armored Force, Lieutenant General Leslie McNair, General Headquarters Chief of Staff. He believed a large anti-tank capability was needed to defeat the German panzer units instead of a large Armored Force. In developing the umpire evaluations for the maneuvers, General McNair and his staff wrote rules that were highly favorable to anti-tank weapons and minimized the capabilities of armored units. Predictably, large numbers of tanks were assessed

as "destroyed" from anti-tank fire thereby validating General McNair's beliefs. The official after action report, also written by General McNair's staff, stated:

> The maneuvers had shown that armored forces were not invincible. On the contrary, the proper use of antitank weapons, terrain, and demolitions supplied the answer to the problem of meeting what had been described as the hardest and fastest striking force in modern warfare.[30]

Even before the conclusion of the maneuvers, General McNair convinced the Secretary for War that the Armored Force was not the answer to stopping German panzer units and that the development of anti-tank forces should be stressed instead.[31] In November 1941, the Army Chief of Staff created a new arm called the Tank Destroyer Force consisting of 220 tank destroyer battalions. The force was responsible for training, doctrine, and development of all anti-tank weapons, towed and mechanized. Although the Tank Destroyer Force proved its value during the war, the establishment of this arm was a challenge to the development of the Armored Force in that valuable resources were expended building and training the new force. Development of a heavy tank destroyer was a major factor in the Armored Force not fielding a heavy tank until late 1944. Additionally, the Tank Destroyer Force was used as justification to reduce the planned growth of the Armored Force.[32]

The creation of the Tank Destroyer Force was unique among the militaries of the world. Its existence further solidified the idea that the U.S. Armored Force should not be used to fight tanks. In General McNair's view, it was "poor economy to use a $35,000 dollar medium tank to destroy another tank when the job can be done by a gun costing a fraction as much."[33] As a result, U.S. Armored Force Doctrine was amended to state tanks should not fight tanks. This represented fundamental difference in doctrine from other militaries. German and British tank doctrine, although not encouraging tank on tank battle, realized the necessity of using tanks to blunt an enemy armored attack. Their doctrine influenced the design of their tanks by

emphasizing sufficient armor and armament to fight other tanks.[34] The U.S. doctrine facilitated "medium" main battle tanks that were built for speed and attacking high value targets. As a positive consequence of the updated U.S. tank doctrine, the Armored Force had little choice but to improve coordination between the members of the combined arms team for when, as inevitably happened, they found themselves in combat against enemy tanks.

In addition to the Tank Destroyer Force, General McNair also insisted upon the creation of independent tank battalions for service in the infantry divisions. This decision satisfied the infantry's concerns of having tanks in direct support. The independent tank battalions were directed by the infantry division commanders for tasking to subordinate infantry units. There was no linkage between the independent tank battalions and the Armored Force. When all of the 70+ independent tank battalions were stood up, they accounted for twice as many tanks as existed in the Armored Force. [35] This decision was partially beneficial to the Armored Force as it allowed the armored divisions greater freedom of maneuver.

In August 1941, General Chaffee died of cancer. He was replaced by Major General Jacob Devers. As a former artillery officer, General Devers belief in firepower was one of the catalysts for change in the table of organization for the armored division. One significant change was to equip the division with self-propelled artillery and spotter planes. The self-propelled artillery had better survivability and was considered more mobile than towed artillery. The spotter planes improved the division's reconnaissance and the accuracy of artillery fires. Benefiting from the lessons learned in Europe and North Africa, General Devers also insisted on restructuring the armored regiment by reducing the number of light tank battalions and increasing the number of medium tank battalions.[36] Finally, the arrival of the M3 Lee medium tank and a 75mm main gun increased the division's overall firepower.

Another major change to the tactical employment of the armored division was the creation of combat commands. Unique to the U.S. Armored Force, the combat commands were headquarter staffs that had no permanent troops attached to them. Their purpose was to lead a task force made up of various subordinate units the division assigned them.[37] The combat commands gave the armored division tremendous flexibility for task organizing in order to accomplish a wide variety of missions. Combat commands also fostered a degree of cooperation between tank, artillery, and infantry units that was unprecedented in any other allied formations.[38]

Lessons Learned in North Africa

In March 1941, German armored forces landed in the deserts of North Africa and scored immediate success against the Allied Eighth Army led by the British. For the first year and a half of the North Africa Campaign, Allied armored formations were repeatedly beaten in battle by the numerically inferior German formations. The only thing that saved the Eighth Army from complete destruction was their numerical and material superiority. Although the British had experimented with tank employment for many years, their tank doctrine was inferior to the Germans. Lieutenant General Fritz Bayerlein, Chief of Staff for PanzerArmee Afrika, gave his assessment of the British tactics during the winter campaign of 1941-1942:

> Contrary to the principle that one can never be strong enough at the center of gravity and must concentrate everything at that point, every attack was made by part of only the Eighth Army, and even the main offensive force, already too weak for its purpose, was thrown into battle dispersed.
>
> The result of these tactics of dispersal was that the British formations were either badly battered or destroyed one after the other and disappeared from the theater while the battle was still in progress. The British Command did not once, during the whole of this battle, succeed in conducting operations with a concentration of its forces at the decisive point. This fundamental mistake was one of the reasons why victory escaped them. Their unwieldly and rigidly methodical technique of command, their oversystematic issuing of orders down to the last detail, leaving little latitude to the junior commander,

and their poor adaptability to the changing course of the battle were also much to blame for the British failures.

Immobility and a rigid adherence to pattern are bad enough in European warfare; in the desert they are disastrous.[39]

The British Commanders eventually reached the same conclusions as the Germans. As late as the Gazala Battles beginning in May 1942, General Messervy, Commander of the British 7th Armoured Division wrote:

> His (the German) handling of armour, anti-tank guns and mechanised formations in cooperation was, with the schwerpunkt idea, much better than our rather dispersed idea of fighting... We were given area commands, not functional commands - which kept fluctuating. We never fought as a division - always getting different brigades, trained in different ways.[40]

As did their American counterparts, the British continued to make adjustments to the tables of organization and employment of forces within the armored divisions. Specifically, they reduced the number of tanks in their divisions and increased the number of infantry. They also worked to improve coordination within their combined arms teams.[41] Although they never reached the level of proficiency found in the German panzer divisions, the British armored units in late 1942 were a much improved fighting force than they had been at the beginning of the campaign.

Prior to the U.S. landings in North Africa, the Armored Forces sought to learn from the British experiences against the Germans. Several liaison officers were sent to observe British operations. Other U.S. officers and enlisted personnel actually served in British tank units in order gain firsthand experience in battle. Upon return to the United States, these personnel passed on their observations through papers, lectures, and instruction to the rest of the Armored Force. Despite their comparative inexperience, U.S. tankers possessed a sense of superiority over their allies and did not hold the British Army or their tactics in high regard. They discounted many of the lessons learned from the Allied experience in North Africa.[42] As a

result, the Armored Force had to pay a price in blood for knowledge previously gained by their allies.

Although the United States had not yet entered the war, it was obvious to many observers the Armored Force was likely to soon be fighting in a desert environment. Lieutenant General George Patton, now in command of I Armored Corps, located an enormous area in the in the southwest desert for use as a tank training site.[43] The new Desert Training Center was based out of Camp Young, California. From April 1941 until the time it was closed in December 1943, many of the newly established armored divisions passed through Desert Training Center. Strangely, the two armored divisions that eventually deployed to North Africa were among the few armored divisions that never trained at the Desert Training Center.[44]

On 8 November 1942, U.S. forces landed in Morocco and Algeria as part of Operation Torch. Two armored divisions, the 1st and the 2nd, were the first Armored Force units to see combat during World War II. In their first major engagement, U.S. Forces, including elements of the 1st Armored Division, were nearly routed by the Germans during the Battle of Kasserine Pass.[45] Rapidly incorporating lessons learned on the battlefield, the U.S. Armored Forces showed steady improvement for the remainder of the campaign. While their performance was not spectacular, it was good enough to defeat the depleted Axis forces. Outnumbered and lacking critical supplies, the Axis forces finally surrendered in May 1943. Surprised by the speed at which the Americans were able to adapt to modern combat, the Germans had high praise for the U.S. forces. Field Marshall Erwin Rommel, Commander of Panzerarmee Afrika expressed his views in his memoirs:

> What was astonishing was the speed with which the Americans adapted themselves to modern warfare. In this they were assisted by their extraordinary sense for the practical and material and by their complete lack of regard for tradition and worthless theories... The leaders of the American economy and the American General Staff have achieved

> miracles. The organization, training, and equipment of the U.S. Army all bear witness to great imagination and foresight, and above all, to the positive determination of the American people to act in unison and create a war machine with real striking power. Starting from scratch, an army has been created in the very minimum of time, which in armament and organization of all arms, surpasses anything the world has yet seen. Though we may perhaps still retain some lead over them in the quality of certain items of our equipment, yet the general balance of American organization and the steady development they have achieved in equipment and armament are things we have not yet been able to equal.[46]

Despite Field Marshall Rommel's high regard for the Americans, there was still plenty improvement to be made before the U.S. forces landed on the European continent. A thorough analysis of the North Africa Campaign was initiated even before the final surrender of the Axis forces. Combat operations proved to be the ultimate learning experience for the Armored Force. A top to bottom review was conducted and significant changes were implemented over the course of the next year.

To start, there were numerous deficiencies in tactical execution that required improved training for the Armored Force. In the attack, U.S. armored units frequently made a habit of blundering headfirst into German defensive positions instead of using enveloping attacks. Although the attacks were sometimes successful, the cost in lives and material was extremely high. In the attack and in defensive positions, there was poor coordination between the various elements of the armored divisions especially in the use of combined arms.[47] Too often tank battalions engaged German units without adequate support from the infantry or artillery.

Poor use of reconnaissance was another shortfall of the Armored Force in all phases of combat. During the Battle of Kasserine Pass, Combat Command C from the 1st Armored Division was ordered to assist Combat Command A which had been badly mauled the day before by two panzer divisions. Combat Command C moved out in column formation with a battalion of medium tanks as the lead element, two companies of self-propelled howitzers, an armored

infantry battalion, and a medium tank company in the rear. With no forward reconnaissance, and only a company of tank destroyers covering the flanks, Combat Command C blindly charged into the two panzer divisions. Although elements of the artillery and infantry units were able to escape, the tank battalion was destroyed by the Germans.[48] In another instance, Combat Command B was retreating from the fighting near Medjez el Bab. Without conducting reconnaissance of the withdrawal route, the force became mired in unmarked bog and lost 18 tanks, 41 guns, and 132 other vehicles.[49] Not learning fast enough from these debacles, U.S. Armored Force commanders continued to demonstrate poor reconnaissance techniques throughout the campaign.

Other tactical errors included poor use of deception, poor use of terrain, and improper dispersion of vehicles. Seemingly without fail, the Germans made the Americans pay for their novice mistakes. Although the errors were costly, the experiences gained through combat highlighted the tactical deficiencies in the Armored Force and lead to improvements in training and overall efficiency. The general consensus among the Armored Force officers was that "Our troops will fight better in the future, as a result of the beating they took initially.[50]

One of the primary takeaways from North Africa was that the Armored Force doctrine was basically sound. The breakdown in operations was that doctrine found in the army field manuals did not match the tactical execution on the ground. Specifically, the official U.S. after action report "Lessons Learned by the American Army during the Tunisian Campaign" noted the most significant tactical mistake was the failure to concentrate armored forces at the decisive point:

> The outstanding general lesson of the campaign was the failure to use the armored division in sufficient strength or in concentrated mass. The one armored division that participated was not employed as a unit until after the last phases of the battles for MATEUR and BIZERTE. Previous to these actions, the armor "arrived piecemeal and

> was used piecemeal throughout." As states by the commander of one of the combat commands, "Offensive action by American armored troops was marked by a dispersal of effort." ...The principal of mass action with armor, employed in depth on a narrow front and directed against weak segments of the hostile line, should be the guiding formula in major offensive armored action.[51]

Obviously, one of the major lessons learned by the British was ignored by commanders of the Armored Force. As it turned out, the poor combat performance of several Armored Force commanders was perhaps a blessing in disguise. As incompetent commanders were relieved, they were replaced by highly capable armor officers such as General Patton.

Based on lessons learned in North Africa, the table of organization and equipment for the armored division was again modified in early fall of 1943. Combat operations demonstrated a shortfall in the number of infantry units in the previous table of organization. The new structure now included three battalions of infantry, tanks, and artillery resulting in a "triangular" division. The equal number of infantry, tank, and artillery units signified the importance of all three as part of a combined arms team. Some elements of the division had not proven effective during combat such as the light tank battalions in their role as maneuver elements and were therefore eliminated. Instead, a light tank company was added to the medium tank battalion as a reconnaissance asset. Additionally, per the recommendations of the armored commanders, each of the battalions within the division became self-sufficient with the addition of a battalion logistics unit.[52] This modification greatly enhanced the flexibility of the combat commands as they were no longer as dependent on support from the division.

Furthermore, the U.S. Army was experiencing a shortage of transport shipping across the Atlantic. In order to ease the strain on shipping, an Army Reduction Board was established to recommend cuts in the tables of organization and equipment of all types of divisions. The approved changes to the armored divisions' tables of organization reflected an overall reduction

in manpower from 14,618 to 10,936. Most of the troop reductions came from the elimination of three regimental headquarters units and logistics units. Against the wishes of most armored officers, the strength of the tank battalions was reduced from 390 to 263 tanks. Certain capabilities were also lost due to the elimination of units such as the tank destroyer and antiaircraft companies.[53] One benefit of the smaller-sized division was that it was easier to maneuver while improving flexibility and control.

A vital component of the Armored Force made its initial appearance during the North Africa Campaign. The M4 Sherman medium tank was a significant upgrade over the Lee tank it was designed to replace. Although initial variants of the Sherman had the same 75mm as the Lee, the gun was gyro-stabilized and mounted on a powered traversing turret which allowed gunners to quickly engage targets.[54] Additionally, the Sherman, was more heavily armored, faster, more reliable, and had a lower profile than the Lee tank. By the war's end, over 40,000 Sherman tanks had been produced, second in production only to the Soviet T-34. From its introduction until the end of the war, it served as the workhorse of the Armored Force.[55]

When the Sherman first appeared on the battlefield in late 1942, it has sufficient firepower to go head-to-head with all German tanks except the Tiger. By the time of the Allied landings in Normandy, German tank development had rendered the Sherman 75mm main gun insufficient to defeat the next generation of German armor. Although some variants of the Sherman tank carried larger caliber main guns than the 75mm, Armored Force doctrine strongly discouraged tanks fighting other tanks. As a result, the U.S. continued to mass produce the Sherman and did not aggressively pursue development of a replacement tank.[56] However, since tank versus tank battles were unavoidable, the Armored Force worked to improve coordination

measures with the combined arms team and specifically with close air support to offset the lack of tank firepower.[57]

The fighting in North Africa had also demonstrated that coordination measures between armored units and close air support were unsatisfactory. In particular, armored requests for air support were unwieldy and unresponsive. A focused effort was started shortly after the end of the campaign to better use the firepower provided by the Allied air forces. During the invasion of Italy, Armored Force units were equipped with the improved close air support procedures. The Italian Campaign was used to further refine coordination measures which included an air support officer accompanying each combat command. Additionally, each combat command was assured more timely support by virtue of continuous fighter bomber coverage during movements.[58] By the time of the Allied landings at Normandy, U.S. armored units and their close air support had meshed to form a deadly combination.

Other Tank Forces in Western Europe

When compared to the U.S. Armored Force of 1944, the German and British tank forces fighting in Western Europe had substantial differences in organization, doctrine, and equipment. The most significant organizational difference between German panzer divisions and U.S. armored divisions was the ratio of infantry to tank battalions. In the type 1944 panzer divisions, there were four infantry battalions to two tank battalions as compared to the U.S. armored divisions which had three of each. The SS panzer divisions had an even higher ratio of infantry to tanks at six to two. The major factor limiting panzer divisions to two tank battalions was the inability of German industry to replace heavy losses in tanks. Divisions only two battalions of tanks ultimately resulted in degraded offensive capability as combat losses exceeded replacements.[59]

At approximately 15,000 men, panzer divisions were almost a third larger than U.S. armored divisions in total personnel. The SS divisions were even bigger; SS Panzer Division Lehr had over 21,000 men. The increased size of the German panzer divisions was accounted for in additional units such as air defense and anti-tank; similar units had previously been dropped from the U.S. armored divisions. Interestingly, there was a wide variance between the authorized strengths of each of the panzer divisions, most notably in types of tanks or numbers of tank battalions. Additionally, after five years of combat, most German panzer divisions were substantially short-handed in men and material. These factors resulted in a surprising variation in combat strength between the different panzer divisions.[60]

Doctrine represented another significant difference between the U.S. and German tank forces. The German method of war was focused on *Vernichtungsschlacht,* the battle of annihilation. This concept drove the Germans to seek the physical destruction of the enemy forces as the decisive factor. In order to accomplish this, German tank doctrine emphasized a combined arms approach to defeat any enemy formations, including armor, encountered on the battlefield. As the Germans could not rely on air support, main battle tanks were forced to assume a more prominent role in stopping enemy armor.[61] This led to the development of tanks with sufficiently heavy armor and armament to destroy enemy tanks. By the summer of 1944, Germany was producing the Pz IV model J, and variants of the Panther and Tiger tanks, all of which had superior armor and armament to the Sherman.[62]

One similarity between the U.S. and German armored forces was the employment of a combined arms command within the armored divisions. In the U.S. armor divisions this unit was called the combat command; in the German panzer divisions this unit was called the *kampfgruppe* or battlegroup. The *kampfgruppe* was not unique to the panzer divisions and could

vary drastically in size, but within the panzer divisions, it was generally equivalent to a brigade. The flexibility of the *kampfgruppe* was one of the strengths of the German Army in that it could be task organized from virtually any units required to accomplish a specific mission. In this respect, it was even more flexible than the U.S. combat commands which were built around the permanent base units of a specific tank battalion and infantry battalion.[63]

Although in 1940 the U.S. Armored Force had partially modeled itself on the British armored forces, the two later developed their own unique characteristics. The 1944 British armored division reflected the same organizational structure originally established in 1942, with the exception of a reduction of four artillery battalions. The ratio of infantry battalions to tank battalions remained equal at four apiece. Three of the infantry battalions were grouped into the infantry brigade. Three of the tank battalions and one infantry battalion were grouped into the armored brigade. The other tank battalion served as part of the reconnaissance regiment. At a total strength of 14,964 personnel, the British armored divisions were also significantly larger than their U.S. counterparts. The increased size was a result of the additional infantry and anti-armor battalion as well as a larger reconnaissance force.[64]

In the development of tank doctrine, both the U.S. and the British emphasized the role of the armored division as an exploitation force. In the British armored forces, this type of doctrine was executed by specific models of tanks known as a "cruisers." Cruiser tanks, like the Cromwell and the Sherman, possessed the speed, firepower, and armor to exploit a breakthrough and attack targets in the enemy's rear areas. The British also recognized the need for tanks in direct support of the infantry divisions. These tanks were known as "infantry" tanks. Two infantry tanks, the Matilda and the Churchill, were slower and more heavily armored so they could fight with the infantry divisions under heavy fire from the enemy. By 1944, the Matilda

and Churchill tanks were obsolete. Lack of production capacity prevented the development of a new model and forced the British to use the Sherman tank as both a cruiser and infantry tank.[65]

One problem that continued to hurt the British armored divisions was the lack of coordination between infantry and armored units. Throughout the North Africa Campaign and even as late as Operation Goodwood in 1944, British armored divisions incurred high losses in tanks as a result of unsupported attacks against German positions. A major contributing factor was the British had no organizational counterpart to the U.S. combat command or the German *kampfgruppe* that united the British forces as a combined arms team. Within the armored divisions, the infantry and armored brigades were deployed as independent maneuver elements, which limited close coordination. Even though the armored brigade possessed one infantry battalion known as the "motor battalion," this unit was improperly used as a follow-on force to the tanks.[66] Not until late in the North Africa campaign did the British realize the value of close cooperation between the infantry and armored units and begin to facilitate measures for better coordination.

A Uniquely American Armored Force

From its inception on 10 June 1940 until the Normandy landings on 6 June 1944, the U.S. Armored Force had rapidly transformed into a powerful instrument of war. Initially conceived as a combination of American, Allied, and Axis ideas of armored warfare, battle-tested in North Africa and Italy, the U.S. Armored Force had transformed into a force distinctive from any other in the world. Armed with a unique doctrine, high-quality equipment, unsurpassed overall mobility, a flexible command structure, and unmatched lethality from combined arms fires, the Armored Force represented some of the finest characteristics of American fighting ability. When

led by aggressive and competent commanders, the Armored Force proved more than a match for their German adversary fighting in Western Europe.

During the initial invasion of France, five U.S. armored divisions fought in the Normandy Campaign. Initially, all Allied forces were contained near the beachhead by extremely restrictive terrain and fierce resistance from the German Army Group B. The Armored Force was not designed for this type of battle and was employed almost exclusively as direct fire support for the infantry. Lacking the heavy armor of the German Panther and Tiger tanks, the Sherman tanks were at a disadvantage in the close-in fighting and the Armored Force suffered heavy losses.[67]

Finally, after eight grueling weeks of combat through the hedgerows, the U.S. forces were able to breakthrough the German lines and begin a battle of maneuver. The execution of the breakthrough was an indication that the Armored Force had learned at least two of the major lessons from North Africa. First, infantry, not armor, was used to initiate the breakthrough of the German lines. As opposed to grinding away at the German defenses, armored units were thus able to conserve their strength for the exploitation phase. Second, armor was concentrated in sufficient mass at the point of the breakthrough. This enabled the armored units to blast their way through the remnants of the German defense and sustain the exploitation against German counterattacks.

Exploitation of the breakthrough was one of the primary missions U.S. commanders had in mind when designing the Armored Force. Ordered to advance east as fast as possible, six U.S. armored divisions, with continuous fighter-bomber coverage overhead providing reconnaissance and close air support, lead the Allied advance across France. Disregarding the danger to their flanks, the armored divisions raced forward with the logistics and support elements in tow.

Finally, after sprinting over 450 miles, the advance was finally halted just short of the German border primarily due to fuel shortages.[68]

There were several factors contributing to the Armored Force's successful exploitation. First, the speed and tactical mobility of all elements within the U.S. armored divisions, including infantry, artillery, and engineers, forestalled the Germans from reforming another defensive front. Scattered pockets of the German Army tried to resist the American advance, but were quickly bypassed or destroyed. Additionally, speed of the Armored Force advance was enhanced by the mechanical reliability of the American-made vehicles. Only a small percentage of the Armored Forces vehicles were lost to mechanical failures during the march westward. Finally, the armored divisions were able to maintain speed of the exploitation by decentralizing command and operating from mission type orders. Responsibility for maintaining momentum of the advance was in the hands the combat commanders which allowed for rapid decision making at the point of contact with the enemy.[69]

After the successful exploitation phase across northern France, the Armored Force was again facing strong German defenses that would have to be defeated in combat. As one British officer asked about the Americans, "They can drive, but can they fight?"[70] Throughout the remainder of the war, the Armored Force did indeed fight well against the Germans. Still deficient in armor and armament in comparison to the panzer units, Armored Force commanders had learned to maximize their advantages over the Germans. In a series of battles later known as the Lorraine Campaign, commanders of the U.S. 4th Armored Division repeatedly used the speed and tactical mobility of their forces to outmaneuver their opponents of the Fifth Panzerarmee. They also demonstrated superior knowledge of combined arms as they employed fires from close air support, artillery, and tank destroyers to mitigate the deficiencies of the Sherman's main gun.

As a result of the superior fighting ability of the Armored Force, the 4th Armored Division was able to stop the large German counteroffensive aimed at destroying American bridgeheads on the Meuse River.[71] Throughout the remainder of the war, the Armored Force more than proved itself capable of achieving decisive effects anytime it was on the battlefield.

Conclusion

Slow to realize the potential of the tank, the United States largely wasted the interwar period in developing a modernized armored force. Spurred into action by the shocking defeat of the Allied armies in June 1940, the U.S. Army moved quickly and decisively to establish the Armored Force. Although hampered by doctrinal disputes, equipment shortfalls, and competition from other branches within the Army, the Armored Force rapidly expanded into a multi-division organization. Deployed to North Africa in late 1942, the Armored Force validated its doctrine in combat while also learning numerous tactical lessons about armored warfare against the Germans. By the time of the Allied landings in Normandy, the Armored Force had evolved into a uniquely American, but highly lethal arm. Maximizing the advantages of its superior mobility, lethality from combined arms fires, reliable equipment, and flexibility from the combat command structure, the Armored Force successfully carried out its duties on the battlefield and played a decisive role in the Allied victory over the Axis Powers.

Notes

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[3] Ibid., 25.

[4] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 14.

[5] Ibid., 122.

[6] Ibid., 37-39.

[7] Jarymowycz, *Tank Tactics From Normandy to Lorraine*, 28-29.

[8] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 57-61.

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[10] Jarymowycz, *Tank Tactics From Normandy to Lorraine*, 29.

[11] Ibid., 31.

[12] Kenneth Macksey *Tankforce, Allied Armor in World War II* (New York: Ballentine Books Inc., 1970) 21.

[13] Jarymowycz, *Tank Tactics From Normandy to Lorraine*, 31.

[14] Bruce I. Gudmundsson, *On Armor* (London: Praeger, 2004), 133.

[15] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 250-251.

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[17] Jarymowycz, *Tank Tactics From Normandy to Lorraine*, 73.

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[19] Ibid., 134-135.

[20] Ibid., 134-135.

[21] Ibid., 135-136.

[22] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 270.

[23] Ibid., 270.

[24] Ibid., 271.

[25] Macksey, *Tankforce, Allied Armor in World War iI,* 63.

[26] Ibid., 283.

[27] Ibid., 135-136.

[28] Gudmundsson, *On Armor,* 140-141.

[29] Jarymowycz, *Tank Tactics From Normandy to Lorraine*, 72.

[30] Ibid., 72.

[31] Ibid., 73.

[32] Ibid., 73-74.

[33] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 316.

[34] Ibid., 442-443.

[35] Geoffrey Perret *There's a War to be Won The United States Army in World War II* (New York: Random House 1991) 101.

[36] Perret, *There's a War to be Won The United States Army in World War II,* 98-99.

[37] Ibid., 99.

[38] Gudmundsson, *On Armor,* 138-139.

[39] B. H. Liddell Hart, ed., *The Rommel Papers* (New York: Harcourt, Brace and Company, 1953), 184.

[40] Correlli Barnett *The Desert Generals* (Bloomington: The Indiana University Press, 1982) 154.

[41] Gudmundsson, *On Armor,* 134-140.

[42] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 385-389.

[43] Perret, *There's a War to be Won The United States Army in World War II,* 101-103.

[44] Christopher R. Gabel *Camp Colt to Desert Storm The History of U. S. Armored Forces* ed. George Hoffman and Donn Starry (Lexington: The University Press of Kentucky, 1999) 150.

[45] Ibid., 150-152.

[46] Hart, *The Rommel Papers*, 521-522.

[47] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 386-387.

[48] Gabel, *Camp Colt to Desert Storm The History of U. S. Armored Forces* 151-152.

[49] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 387-388.

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[51] The Nafziger Collection, *Lessons Learned by the American Army during the Tunisian Campaign* (Washington: United States Government Printing Office, 1943) 16.

[52] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 383-385.

[53] Ibid., 383-384.

[54] Allyn R. Vannoy and Jay Karamales *Against the Panzers, United States Infantry versus German Tanks, 1944-45* (Jefferson, NC and London: MacFarland & Company, Inc., Publishers, 1996) 12.

[55] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 461-462..

[56] Macksey, *Tankforce, Allied Armor in World War II,* 129.

[57] Cameron, *Mobility, Shock, and Firepower The Emergence of the US Army's Armor Branch, 1917-1945*, 442-443.

[58] Jarymowycz, *Tank Tactics From Normandy to Lorraine*, 215.

[59] Ibid., 97-109.

[60] R.L. Dinardo, *Germany's Panzer Arm* 105.

[61] Ibid., 78-86.

[62]General Heinz Guderian *Panzer Leader* 296.

[63] R.L. Dinardo, *Germany's Panzer Arm, 105-108.*

[64] Jarymowycz, *Tank Tactics From Normandy to Lorraine*, 109.

[65] Macksey, *Tankforce, Allied Armor in World War II,127-129.*

[66] Gudmundsson, *On Armor,* 138-139.

[67] George F. Hofman *Camp Colt to Desert Storm The History of U. S. Armored Forces* 162-166.

[68] Ibid., 166-169.

[69] Ibid., 166-169.

[70] Jarymowycz, *Tank Tactics From Normandy to Lorraine*, 231.

[71] Ibid., 231-247.

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